

Attachment 1: EPA Comments

1. Project Info and Site Characterization

1.1 EPA Comment:

The list below consists of primary sources and research that were referenced or referenced inaccurately within A.4.1 C6 Per App Narr CBI - Rev No. 4 March 2022 that was not included in section A.4.1 Narrative references.

GCS References:

Anadrill (1987)

Clark et al. (1987)

Core Laboratories (1987a)

Core Laboratories (1987b)

Horton (2012)

Hosseini (2019)

Hovorka et al. (2018)

Jackson and Galloway (1984)

Jolley et al. (2007)

Knipe (1992)

Leeds and Associates (1989)

Matthews and Kelly (1967)

Meckel, (2007) – referenced within GSDT under Injection Well #2-4 under Operational Information tab

Peng and Robinson (1976)

Pickering et al. (2007)

Schlumberger (1987)

Schlumberger (1988)

Seni et al. (1997)

Spencer (1977)

Stenzel (1946)

Stevenson and Agnew (1985)

Weber and Daukoru (1975) – typo in the narrative? (pg.29 A.4.1)

Wesselmann and Aronow (1971) – typo in narrative?

Yale (1993)

Zimmerman (1990)

1.2 EPA Comment:

Figure 2.23 well logs (42361306260000 and 17019205730000) are not identified on 2.22 AoR cross-section base map.

1.3 EPA Comment:

The statement below contains a direct quote. GCS should provide the source document for the quote.

An important conclusion in this study is that the sluggish circulation within the deep saline aquifers “demonstrates that geological confinement is effective on both a local and regional scale.”

1.4 EPA Comment:

Limited core sample analysis was available for the project area. Samples were collected 5+ miles away from nearest proposed injection well site. Local in-situ samples of the confining and injection zone are crucial to assigning representative site model parameters and assuring due diligence was achieved by both applicant and region 6 from a public perspective.

“Site-specific data will be collected in pre-operational data testing prior to commencement of injection to verify this data.” Pg.25

“Prior to operations at Project Minerva, and consistent with the Pre-Operational Testing Program, whole core samples from the upper Frio and Anahuac formations will be acquired and analyzed for porosity, permeability, and mineralogy. The geomodel and reservoir simulation model will be updated with the newly acquired site-specific data.” Pg. 79

Region 6 commends GCS for acknowledging site-specific data gaps and recommends the aforementioned action be taken as soon as possible.

1.5 EPA Comment:

Region 6 requests further clarification and explanation of the following Class VI application items.

“Project Minerva benefits from the following trapping mechanisms:

- Buoyancy trapping against the Anahuac Formation
- Relative permeability hysteresis
- Dissolution of gaseous phase CO₂ into the formation’s aqueous phase
- Localized buoyancy trapping within 4-way closures, where they may exist”

For example, explain when and where displacement of CO₂ by the original wetting fluid/brine occurs, the rate of simulated displacement, how that will be checked and measured in the subsurface, and how far outward from the injection well imbibition is projected to occur after injection ceases.

1.6 EPA Comment:

Region 6 requests further clarification and explanation of the following items.

“As part of the GCS evaluation workflow, all faults within the AoR have been mapped where 3D seismic is available.”

How does GCS plan to evaluate areas where 3D seismic is not available?

1.7 EPA Comment:

GCS should include the study referenced below by the Bureau of Economic Geology and reference the relative concepts, so region 6 can better understand the transmissivity potential of the faults within the project area.

“A fault transmissibility study conducted by the Bureau of Economic Geology (BEG) at the University of Texas, discussed in Sections 2.2.5, concluded that faults within the AoR are not sufficiently transmissive to allow migration of fluid vertically from the Injection Zone.”

1.8 EPA Comment:

Figures 2.8, 2.9, 2.9 (a), 2.12, and 2.13 have Oklahoma identified in the upper left-hand section. From what Region 6 garnered from the legend, these maps do not expand to Oklahoma.

1.9 EPA Comment:

GCS' fault seal analysis requires further clarification:

“Several mechanisms have been recognized whereby fault planes can act as seals (Knipe, 1992):

- a) Juxtaposition, in which reservoir rock are juxtaposed against a low-permeability unit with a high entry pressure
- b) Clay smear or entrainment of clay/shale into the fault plane, thereby giving the fault “disturbed zone” a high entry pressure
- c) Cataclasis, which is the crushing of sand grains to produce a fault gouge of finer grained material, giving the fault “disturbed zone” a high capillary pressure
- d) Diagenesis, where preferential cementation along a previously permeable fault plane may partially or completely remove porosity, creating a hydraulic seal”

Clarification may be facilitated by providing the reference (Knipe, 1992) and/or obtaining in-situ data to define fault conditions.

2. Area of review (AoR) Corrective Action Plan

2.1 EPA Comment:

The table below contains a list of wells that fall within the AoR but do not penetrate the confining zone according to what was mentioned in the file B.11.2 Location of Wells Requiring Corrective Action. However, well records of the below wells were not included with the other well schematics in Appendix 2 Well Schematics v2 file. Since these wells fall within the AoR, EPA will require the well records for all of the wells listed below to be included in Appendix 2 - Well Schematics v2 file. Note that these records will be needed in order for the technical review of the Artificial Penetrations (APs) to move forward.

Well Serial Number	API Num	Well Name	Well Num
247403	42361309510000	HBY RE SUA;SABINE OUTBACK	1
247043	42361309480000	HBY RD SUA;E W BROWN JR	1
226811	42361307880000	VUA;E W BROWN JR PROPERTIES	1
178925	42361304130000	SL 7960	1
224966	17023227730000	J B WATKINS	2
223498	17023227730000	J B WATKINS	2
224091	17023227730000	J B WATKINS	2
224965	17023227720000	J B WATKINS	1
224080	17023227720000	J B WATKINS	1
223486	17023227720000	J B WATKINS	1
162749	17023213710000	TRACY-COX	1
236794	17019222030000	R E ODOM	1
234619	17019221300000	E W BROWN JR PROPERTIES ETAL	1
227030	17019219760000	OPAL GRAY TRUST	1
225598	17019219410000	WALKER LOUISIANA PROPERTIES	2
225229	17019219280000	DONNER PROPERTIES	1
217724	17019217690000	ODOM ESTATE	1
205643	17019215300000	BEL ESTATE	1
198053	17019213900000	M G STREAM	1
196188	17019213690000	ODOM	2
147572	17019205680000	MATILDA GRAY STREAM "F"	6
225994	17019205680000	M G STREAM ET AL	10
145139	17019205400000	MATILDA GRAY STREAM "F"	4
140150	17019204390000	W E WALKER	7
140077	17019204380000	MATILDA GRAY STREAM F	1
140041	17019204370000	GARDINER-NOBLE FEE A	1
139567	17019204190000	MATHILDA GRAY STREAM J SWD	5
4643	17019031640000	HALCARAKE	1
113357	17019026210000	JOHN W MECOM ET AL	1

100615	17019025220000	E W BROWN JR	1
27440	17019020990000	J G GRAY ESTATE	4
247615	17019020990000	MATILDA GRAY STREAM J	31
246409	17019020990000	MATHILDA GRAY STREAM J	31
26953	17019020980000	J G GRAY ESTATE	3
26725	17019020970000	J G GRAY ESTATE	2
20212	17019020940000	J W GRAY EST	1
26268	17019020780000	CALCASIEU NATIONAL BANK	3
50842	17019020390000	ODOM-BROWN UNIT	1
53384	17019020380000	ODEM	1
89409	17019019980000	BABETTE ODOM MOORE	1
	42361309270000	HAWK CLUB	1
	42361309140001	PORT OF ORANGE - RIVERSIDE	1
	42361308910000	PORT OF ORANGE-RIVERSIDE	1SW
	42361308670000	ODOM	1
	42361308460001	PORT OF ORANGE-STARK FOUNDATION	1
	42361308180100	HAWK CLUB	1
	42361306460000	BROWN,E.W. JR	1
	42361306260000	DUPONT DE NEMOURS, E.I.	2
	42361306120000	DUPONT DE NEMOURS, E. I.	1
	42361304350000	STARK, NELDA	1
	42361303860000	FROST NATIONAL TRUST	1
	42361001120000	CALLIE SIMMONS ETAL	
	42361001100000	WILLIAMS BUCK	
	42361000160000	MILLER-VIDOR	
	42361000090000	MILLER-VIDOR	
	42361000080000	MILLER-VIDOR	